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| **Mansoura University**<br>**Faculty of Engineering**<br>**Mid Term Exam** | **BME Program**<br>**Level 000**<br>Course Name: **Mechanics 2**<br>Course Code: **MATH004** | Total marks: 20<br>Allowed Time: **1 Hour**<br>Exam Date: **1-4-2019** |

The Exam consists of 4 questions in 4 pages. .يتكون الإمتحان من أربعة أسئلة في اربع صفحات

| Group: | Section: | الإسم (رباعي): |
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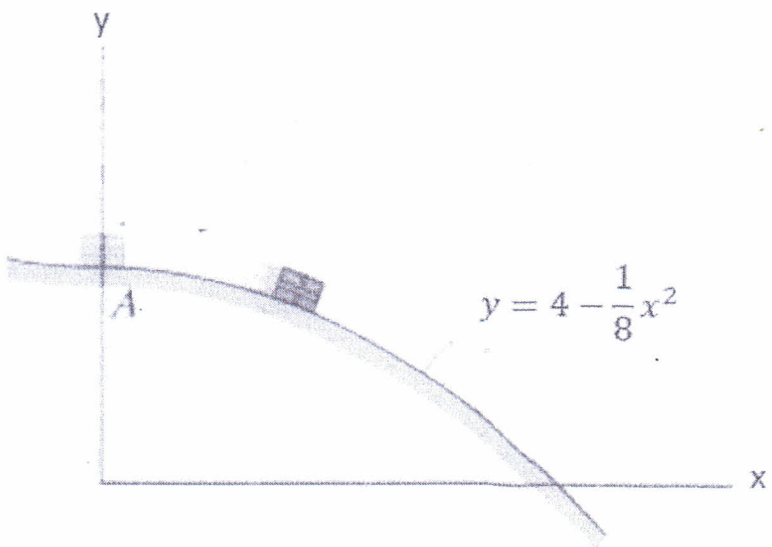
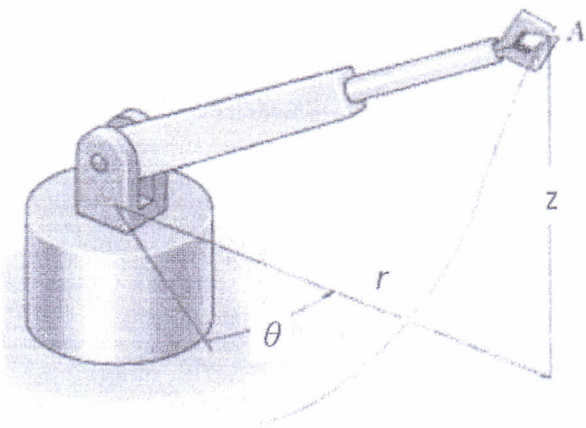
|---|---|
| Question 1: | |
| Question 2: | |
| Question 3: | |
| Question 4: | |

**Total Marks:** /20

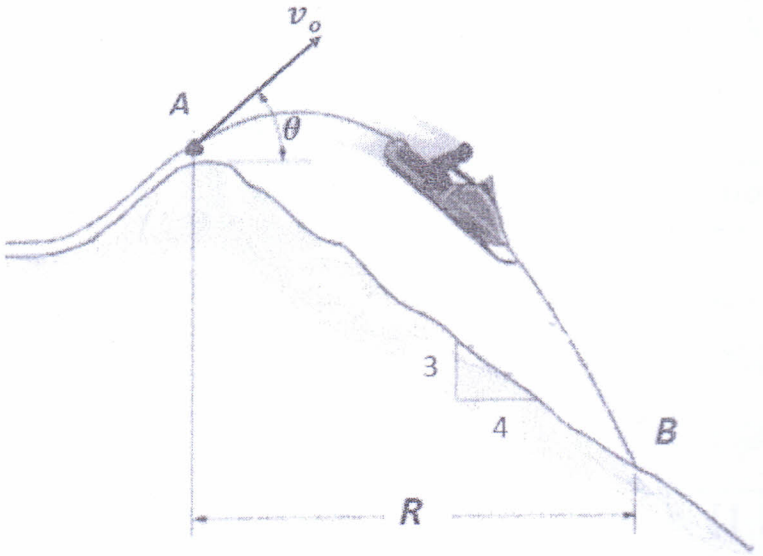
**[Q. 1]** **[5 marks]** The 45 kg box slides on a smooth ramp. If the surface is in the shape of a parabola, determine the normal force on the box at the instant $x = 2.5$ m where its velocity is v = 8 m/sec. Also, what is the rate of increase in its speed, and the magnitude of its acceleration at this instant?



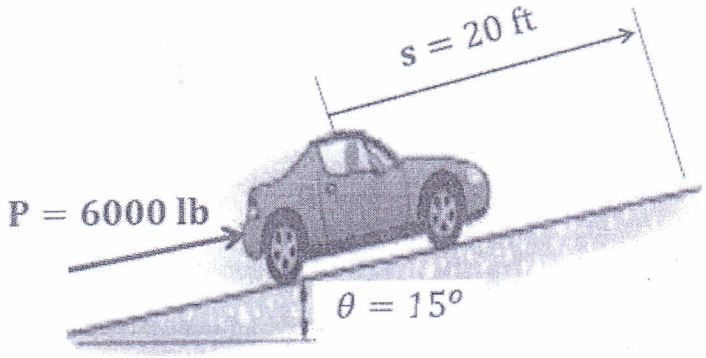
**[Q. 2]** **[5 marks]** The arm of the robot has a variable length so that $r = 3$ ft remains constant and its grip $A$ moves along the path $z = 3\ \sin(4\theta)$ ft. If $\theta = 0.5t$ rad. Determine the magnitudes of the grip's velocity and acceleration when $t = 3$ sec.



**[Q. 3]** **[5 marks]** The snowmobile is traveling at speed $v_o = 10$ ft/sec , $\theta = 35^o$, when it leaves the embankment at $A$. Determine the range $R$ of the trajectory and the speed of the snowmobile at $B$..



**[Q. 4]** **[5 marks]** The motor of 3000 lb car is disabled معطل. If the car is driven up the inclined road by P = 6000 lb for a distance s = 20 ft. Determine: (a) the total work done by all forces applied to the car, (b) the car's velocity at s = 20 ft. The coefficient of kinetic friction between the wheels and the road is $\mu_k = 0.25$.






With all my best wishes, Dr. Neveen Abd El Fattah El Shamy